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(54) DEVICE AND METHOD FOR RECORDING OPTICAL DISC AND DEVICE AND METHOD FOR RECORDING SEMICONDUCTOR STORAGE MEDIUM

(57)Abstract:
PROBLEM TO BE SOLVED: To prevent an illegal copy of a signal of digital video data converted from analogue video signal and to work out a counter measure for inhibition against graded generational copying.
SOLUTION: The analogue video signal with a protect code signal is input in an input terminal 81, is converted into the digital video data by an A/D conversion circuit 82, and is sent to a scramble circuit 85 through a condensation coding circuit 83. A protect code signal detecting circuit 88 detects a state of a protect code signal in an input analogue video signal, generates another copy controlling information and is sent to the scramble circuit 85 and copy controlling information adding circuits 86 and 87. An output from the scramble circuit 85 is sent to the copy controlling information adding circuits 86 and 87, passing through an encoder/modulation circuit 89 and reaching an optical head device 90, thus being recorded in an optical disc RD.

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CLAIMS

[Claim(s)]
[Claim 1] The analog signal input terminal into which the protection signal for illegal copy prevention inputs the analog video signal added within the vertical blanking interval, The A/D-conversion circuit which changes the analog video signal from the above-mentioned signal input terminal into a digital video data, The copy management information which becomes the output of the above-mentioned A/D-conversion circuit from the bit which manages a generation limit of the copy for illegal copy prevention The lead-in groove field section of an optical disk, and/or the addition circuit added to the predetermined location of each record unit in a program field, The encoder which modulates the output of the above-mentioned addition circuit to digital modulation data, The optical head equipment which records the digital modulation output from the above-mentioned encoder on an optical disk record medium, The optical disk recording device characterized by having the detector which detects the protection signal within the vertical blanking interval of the above-mentioned analog video signal, and adding the above-mentioned copy management information to the above-mentioned digital video data in the above-mentioned addition circuit based on the detection output of the above-mentioned detector.
[Claim 2] The predetermined location of each record unit in the above-mentioned lead-in groove field section and the above-mentioned program field is an optical disk recording device according to claim 1 characterized by being the lead-in groove field circles and in the header in a program field, respectively.
[Claim 3] The detector which detects the above-mentioned protection signal is an optical disk recording device according to claim 1 characterized by detecting the

protection code signal included in 20H (H is a level period) of the above-mentioned analog video signal.

[Claim 4] The detector which detects the above-mentioned protection signal is an optical disk recording device according to claim 1 characterized by detecting the protection pulse signal contained in 12H - 19H (H is a level period) of the above-mentioned analog video signal.

[Claim 5] The above-mentioned optical disk recording apparatus is an optical disk recording apparatus according to claim 1 further characterized by scrambling data between the above-mentioned A/D-conversion circuit and the above-mentioned encoder in the above-mentioned scramble circuit based on the detection output of the above-mentioned detector including a compression coding network and the scramble circuit of digital data.

[Claim 6] The above-mentioned optical disk recording apparatus is an optical disk recording apparatus according to claim 1 further characterized by carrying out a data encryption between the above-mentioned A/D-conversion circuit and the above-mentioned encoder in the above-mentioned encryption circuit based on the detection output of the above-mentioned detector including a compression coding network and the encryption circuit of digital data.

[Claim 7] The above-mentioned optical disk recording apparatus is an optical disk recording apparatus according to claim 1 further characterized by carrying out a data encryption to predetermined between the above-mentioned A/D-conversion circuit and the above-mentioned encoder in the above-mentioned encryption circuit based on key information including a compression coding network and the encryption circuit of digital data.

[Claim 8] The above-mentioned optical disk recording device is an optical disk recording device according to claim 5 characterized by being constituted in order of the above-mentioned A/D-conversion circuit, the above-mentioned compression coding network, the addition circuit of the above-mentioned copy management information, the above-mentioned encoder, and the above-mentioned optical head equipment.

[Claim 9] The above-mentioned optical disk recording apparatus is an optical disk recording apparatus according to claim 5 characterized by being constituted in order of the above-mentioned A/D-conversion circuit, the above-mentioned compression coding network, the above-mentioned scramble circuit, the addition circuit of the above-mentioned copy management information, the above-mentioned encoder, and the above-mentioned optical head equipment.

[Claim 10] The above-mentioned optical disk record medium is an optical disk recording device according to claim 1 characterized by being a magneto-optic-disk medium.

[Claim 11] The analog signal input terminal into which the protection signal for illegal copy prevention inputs the analog video signal added within the vertical blanking interval, The A/D-conversion circuit which changes the analog video signal from the above-mentioned signal input terminal into a digital video data, The addition circuit which adds the copy management information for illegal copy prevention to the output of the above-mentioned A/D-conversion circuit, The encoder which modulates the output of the above-mentioned addition circuit to digital modulation data, A means to record the digital modulation output from the above-mentioned encoder on a semi-conductor storage, The protection code signal included in 20H within the vertical blanking interval of the above-mentioned analog video signal (H is a level period), Or/and, it has the detector which detects the protection signal included in 12H - 19H (H is a level period). The recording device of the semi-conductor storage characterized by adding the above-mentioned copy management information to the above-mentioned digital video data in the above-mentioned addition circuit based on the detection output of the above-mentioned detector.

[Claim 12] The analog signal input terminal into which the protection signal for illegal copy prevention inputs the analog video signal added within the vertical blanking interval, The A/D-conversion circuit which changes the analog video signal from the above-mentioned signal input terminal into a digital video data, The scramble circuit which scrambles the output of the above-mentioned A/D-conversion circuit, The encoder which modulates the output of the above-mentioned scramble circuit to digital modulation data, A means to record the digital modulation output from the above-mentioned encoder on a semi-conductor storage, The recording device of the semi-conductor storage characterized by having the detector which detects the protection signal within the vertical blanking interval of the above-mentioned analog video signal, and scrambling the above-mentioned digital video data in the above-mentioned scramble circuit based on the detection output of the above-mentioned detector.

[Claim 13] The detector which detects the above-mentioned protection signal is the recording device of the semi-conductor storage according to claim 12 characterized by detecting the protection code signal included in 20H (H is a level period) of the above-mentioned analog video signal, or/and the protection pulse signal contained in 12H - 19H (H is a level period).

[Claim 14] The process as which the protection signal for illegal copy prevention inputs the analog video signal added within the vertical blanking interval, The A/D-conversion process which changes into a digital video data the analog video signal by which the input was carried out [above-mentioned], The copy management information which becomes the output of the above-mentioned A/D-conversion process from the bit which manages a generation limit of the copy for illegal copy prevention The lead-in groove field section of an optical disk, and/or the addition process added to the predetermined location of each record unit in a program field, The encoding process which modulates the output of the above-mentioned addition process to digital modulation data, The record process which records the digital modulation output of the above-mentioned encoding process on an optical disk record medium, The optical disk record approach characterized by having the detection process which detects the protection signal within the vertical blanking interval of the above-mentioned analog video signal, and adding the above-mentioned copy management information to the above-mentioned digital video data at the above-mentioned addition process based on the detection output of the above-mentioned detection process.

[Claim 15] The process as which the protection signal for illegal copy prevention inputs the analog video signal added within the vertical blanking interval, The A/D-conversion process which changes into a digital video data the analog video signal by which the input was carried out [above-mentioned], The addition process which adds the copy management information for illegal copy prevention to the output of the above-mentioned A/D-conversion process, The encoding process which modulates the output of the above-mentioned addition process to digital modulation data, The record process which records the digital modulation output of the above-mentioned encoding process on a semi-conductor storage, The protection code signal included in 20H within the vertical blanking interval of the above-mentioned analog video signal (H is a level period), Or/and, it has the detection process which detects the protection signal included in 12H - 19H (H is a level period). The record approach of the semi-conductor storage characterized by adding the above-mentioned copy management information to the above-mentioned digital video data at the above-mentioned addition process based on the detection output of the above-mentioned detection process.

[Claim 16] The process as which the protection signal for illegal copy prevention inputs the analog video signal added within the vertical blanking interval, The A/D-conversion process which changes into a digital video data the analog video

signal by which the input was carried out [above-mentioned], The scramble process which scrambles the output of the above-mentioned A/D-conversion circuit, The encoding process which modulates the output of the above-mentioned scramble process to digital modulation data, The record process which records the digital modulation output of the above-mentioned encoding process on a semi-conductor storage, The record approach of the semi-conductor storage characterized by having the detection process which detects the protection signal within the vertical blanking interval of the above-mentioned analog video signal, and scrambling the above-mentioned digital video data at the above-mentioned scramble process based on the detection output of the above-mentioned detection process.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the recording device and approach of a semi-conductor storage at the optical disk recording device for preventing the anti-copying of digital data, and an unauthorized use and an approach, and a list.

[0002]

[Description of the Prior Art] In recent years, in order to protect the copyright of the signal currently recorded by large-capacity-izing and spread of a digital recording medium of an optical disk, semi-conductor storages, etc., prevention of an illegal copy

has been made important. That is, since the duplicate object which does not have degradation by the copy or dubbing can be generated easily in the case of digital audio data or a digital video data and the same data as the original data can copy to it easily in the case of computer data, it is the actual condition which evils, such as infringement of the copyright by the illegal copy, are already producing.

[0003] Since it is such, there are some which are recording the predetermined bit ID for illegal copy prevention on the original digital recording medium for the purpose of prevention of the above-mentioned illegal copy in the so-called digital dubbing which records again the digital signal which reproduced the signal currently recorded on the digital recording medium on a digital recording medium.

[0004] for example, as a method for the above-mentioned illegal copy prevention in the digital audio signal record regenerative apparatus called the so-called R-DAT (Rotary head Digital Audio Taperecoder) To the Maine data area of the digital audio signal recorded on the digital audio tape as a digital recording medium The prohibition code (the so-called SCMS: prohibition code of the specification of a serial copy managerial system) for forbidding prohibition and the gradual generation copy of a digital copy (namely, generation limit) is recorded. When a digital audio signal recording apparatus detects this prohibition code, a method which forbids copy record of the digital audio signal concerned to a new digital audio tape top is adopted.

[0005]

[Problem(s) to be Solved by the Invention] By the way, for example, the digital video signal recorded on digital recording media, such as a digital disk and a semi-conductor storage, is reproduced. In order to protect the copyright of the signal currently recorded on the original digital video record medium as digital dubbing **** of a video signal which records this digital video signal on a digital recording medium again It is possible like the method of the illegal copy prevention between the record regenerative apparatus in above-mentioned R-DAT to record the predetermined bit ID for illegal copy prevention (CGMS: prohibition code of the specification of a copy generation-control system) on an original digital recording medium.

[0006] However, although well functioned about preventing the illegal copy in digital dubbing which was mentioned above in the case of the method which records the predetermined bit ID for the above-mentioned illegal copy prevention on an original digital recording medium For example, reproduce the digital video signal recorded on the original digital recording medium, and D/A conversion is once carried out to an analog video signal. A case so that this analog video signal may be recorded the account of an analog, and when it carries out A/D conversion of the above-mentioned

analog video signal to a digital video signal and it carries out digital recording to it again, the prevention function of the above-mentioned illegal copy will not work, but it can record as it is.

[0007] Namely, D/A conversion of the digital video signal recorded on the digital recording medium as having mentioned above is reproduced and carried out. Even if it is the case where carried out A/D conversion, and digital recording is again returned and carried out to a digital video signal, the account of an analog as it is when it records or, the analog video signal Since the video signal after this dubbing has very little degradation of quality, the method which becomes inadequate as protection of copyrights, therefore can also prevent such an illegal copy certainly is needed. Especially, in recent years, the digital recording medium of the shape of a mass disk has spread as a record medium, and an illegal copy preventive measure to the digital video signal recorded on the digital recording medium of the shape of disk concerned is desired.

[0008] Moreover, in said digital dubbing, if said predetermined bit ID is skipped for the purpose of prevention of an illegal copy, an illegal copy can be realized easily. Therefore, the preventive measure is desired also to an illegal copy which skips such a bit ID.

[0009] In addition, the above-mentioned illegal copy preventive measure is similarly desired, even if it is the digital data of not only a digital video signal but a digital audio signal, or others.

[0010] Then, it aims at providing the optical disk recording device and approach of this invention being made in view of such the actual condition, and once changing digital data into an analog signal, forbidding an analog or carrying out an illegal copy in digital one for this, and also forbidding a still more gradual generation copy, and a list with the recording device and approach of a semi-conductor storage.

[0011]

[Means for Solving the Problem] The optical disk recording device and approach of this invention input the analog video signal with which the protection signal for illegal copy prevention was added within the vertical blanking interval. The analog video signal from the above-mentioned signal input terminal is changed into a digital video data. The copy management information which becomes the digital video data by which conversion was carried out [above-mentioned] from the bit which manages a generation limit of the copy for illegal copy prevention It adds to the predetermined location of each record unit in the lead-in groove field section of an optical disk, and/or a program field. Modulate the output by which addition was carried out

[above-mentioned] to digital modulation data, and the digital modulation output by which the modulation was carried out [above-mentioned] is recorded on an optical disk record medium. The protection signal within the vertical blanking interval of the above-mentioned analog video signal is detected, and an above-mentioned technical problem is solved based on this detection output by adding the above-mentioned copy management information to the above-mentioned digital video data.

[0012] Moreover, the recording device and approach of a semi-conductor storage of this invention The protection signal for illegal copy prevention inputs the analog video signal added within the vertical blanking interval. The analog video signal from the above-mentioned signal input terminal is changed into a digital video data. The copy management information for illegal copy prevention is added to the digital video data by which conversion was carried out [above-mentioned]. Modulate the output by which addition was carried out [above-mentioned] to digital modulation data, and the digital modulation output by which the modulation was carried out [above-mentioned] is recorded on a semi-conductor storage. The protection code signal included in 20H within the vertical blanking interval of the above-mentioned analog video signal (H is a level period), Or/and, the protection signal included in 12H - 19H (H is a level period) is detected, and an above-mentioned technical problem is solved based on this detection output by adding the above-mentioned copy management information to the above-mentioned digital video data.

[0013] Moreover, the recording device and approach of a semi-conductor storage of this invention The protection signal for illegal copy prevention inputs the analog video signal added within the vertical blanking interval. The analog video signal from the above-mentioned signal input terminal is changed into a digital video data. Scramble the digital video data by which conversion was carried out [above-mentioned], and the output by which the scramble was carried out [above-mentioned] is modulated to digital modulation data. The digital modulation output by which the modulation was carried out [above-mentioned] is memorized to a semi-conductor storage, the protection signal within the vertical blanking interval of the above-mentioned analog video signal is detected, and an above-mentioned technical problem is solved by scrambling the above-mentioned digital video data based on this detection output.

[0014]

[Embodiment of the Invention] Hereafter, the gestalt of desirable operation of this invention is explained to a detail, referring to a drawing.

[0015] Here, in this specification, the processing for illegal copy prevention includes the processing to which performs predetermined transform processing or a scramble

is applied to a digital signal to an analog signal. For example, it is an example of processing for illegal copy prevention of the processing which carries out the digital scramble of the digital data which the processing which adds an image transcription scramble signal and/or an image transcription inhibiting signal to the predetermined field of the vertical-retrace-line period of an analog video signal was mentioned as processing for the above-mentioned illegal copy prevention to an analog video signal, and was reproduced from the record medium. As an example of the processing which adds the above-mentioned image transcription scramble signal and/or an image transcription inhibiting signal It continues for two or more level periods of the vertical-retrace-line periods of an analog video signal. The processing which allots the combination signal of two or more white peak signals, or two or more false synchronization pulses and two or more white peak signals, The processing which allots the signal for the processing to which a part of [at least] phases of the color burst signal of an analog color video signal are changed, and the illegal copy prevention coded in two or more bits at the predetermined level period of the vertical-retrace-line periods of an analog video signal is mentioned.

[0016] As a digital recording medium used for the gestalt of operation of this invention, an optical disk is mentioned as an example and flow until it produces the optical disk concerned is explained using drawing 1 .

[0017] First, in the mastering process 30 which produces a master disc MD, the digital video data which changed the motion-picture film into the digital signal, the digital data directly sent from a digital camera, and the digital video data from the digital video tape recorder further for broadcasting stations are supplied to a terminal 1. While compression coding of the so-called MPEG 2 specification which the digital video data was sent to the compression coding network 2, and was standardized here in the so-called MPEG (Moving Picture Image Coding Experts Group: examination organization of dynamic-image coding for are recording), for example supplied through the terminal 1 concerned is performed, it is sector-ized per predetermined amount-of-data unit, for example, 2048 bytes.

[0018] The data sector-ized while compression coding was carried out by the above-mentioned compression coding network 2 are sent to the scramble circuit 9 if needed. The copy management information for preventing the illegal copy which is generated by the copy management information generation circuit 3 and which is mentioned later is also supplied to the scramble circuit 9 concerned, and a scramble is applied to it so that it may mention later to the output data of the above-mentioned compression coding network 2 here using the copy management information

concerned.

[0019] The data with which scramble processing was performed in this scramble circuit 9 are sent to a copy management information addition circuit. The copy management information generated by the above-mentioned copy management information generation circuit 3 is also supplied also to the copy management information addition circuit concerned, and the above-mentioned copy management information is added to the output data of the above-mentioned scramble circuit 9 here.

[0020] In addition, when adding the image transcription scramble signal and/or image transcription inhibiting signal of a mode of an analog video signal to an analog video signal, the above-mentioned scramble circuit 9 is omitted and you may make it send the data from the compression coding network 2 to a direct copy management information addition circuit.

[0021] This copy management information is the so-called TOC (Table Of Contents) of the lead-in groove field which will be equivalent to the most inner circumference or the outermost periphery of an optical disk, and will be established in the start edge of an optical spiral-like truck. It is added to either or both in the header of the data sector inside and in a program field. In addition, the following explanation has described in TOC the example added to both in the header of a data sector. For this reason, the above-mentioned copy management information addition circuit has the addition circuit 5 for adding copy management information in the addition circuit 4 for adding the above-mentioned copy management information in Above TOC, and the header of the above-mentioned data sector.

[0022] Moreover, the above-mentioned copy management information consists of both information which directs the purport which prohibition or digital forbid a copy for an analog and a digital copy, and both [either or] which direct a generation limit of a copy, and the following examples explain it as a thing including both information on these. In addition, it is also possible for accounting information to also be included in copy management information. Only when making only playback of an image into no charge, copying by including this accounting information in copy management information based on the accounting information concerned and a tariff is paid as a charge, it also becomes possible to perform the thing [like] for which a copy is made possible (it forbids a copy in not paying a tariff).

[0023] What consists of 8 bits of b7-b0 as the above-mentioned copy management information at this time as shown in drawing 2 can be mentioned. bit CMC the bit of b7 and b6 by the side of a high order instructs a generation limit to be among these 8 bits

****** -- it shall be assigned, for example, the bit of b2, b1, and b0 by the side of low order shall be assigned as a bit CMM which directs the purport which prohibition or digital forbid a copy for the copy of digital one and an analog Here, it is Above CMM, for example. Digital ones and the ban on the copy of an analog will be shown at the time of (1, 1, 1), and prohibition of a digital copy will be shown by the bit (b2, b1, b0) at the time of (0, 1, 1). Moreover, bit CMC currently assigned to the generation limit in the above-mentioned copy management information in the production phase of the master disc MD concerned The purport which is an original disk will be shown.

[0024] Moreover, making it assign as a bit CMM which directs the purport which does not forbid or forbid a copy only for the bit of b2, for example is also thought of.

[0025] in addition, put in copy management information for every sector unit as mentioned above -- for example, since it enable it to correspond also when the video signal of a different category in an application like the so-called CD-ROM, i.e., the disk of one sheet, be that by which be contained several kinds and unitary management be carry out, it be for arrange not in the whole disk surface but in the condition of having divide in the disk so that it could respond to each category. Moreover, it is also possible to add copy management information not for a sector but for every predetermined block unit.

[0026] The data with which the above-mentioned copy management information was added by the above-mentioned copy management information addition circuit are sent to an encoder / modulation circuit 6. to the supplied data, an encoder / the modulation circuit 6 concerned perform data delay and a parity account as error correcting code-ized processing, add parity, according to a predetermined modulation technique, change 8 bit data into the modulation data of a 16 - channel bit, add the synchronizing signal of the so-called pattern of the AUTOOBU rule which break the modulation regulation of a modulation technique further predetermined [above-mentioned] per predetermined amount of data, and send the data after these processings to optical head equipment 7.

[0027] The optical head equipment 7 concerned performs optical record by irradiating the laser beam driven based on the data supplied from the encoder / modulation circuit 6 to the master disc MD rotated with the spindle motor 8 by which rotation servo control is applied. Thereby, production of a master disc MD by which data logging was made is completed.

[0028] Here, the above-mentioned scramble circuit 9 is an implementation **** thing with a configuration as shown in drawing 3 .

[0029] In this drawing 3 , the so-called parallel-block synchronous type of scrambler

which used the 15-bit shift register can be used for the scramble circuit 9 concerned. The data which added 4 bytes of an error detection code (EDC) to 2048 bytes of the data division from the above-mentioned compression coding network 2 (for example, drawing 5 mentioned later) or the TOC data division of drawing 6 are inputted into the terminal 45 for the data inputs of this scrambler at the sequence that LSB (least significant bit) serves as the point in time, and so-called LSB first. The 15-bit shift register 41 for a scramble The feedback which followed generating-polynomial g(x) =x15+x+1 using the exclusive-OR (ExOR) circuit 42 is applied. The 15-bit shift register 41 According to the bits b2, b1, and b0 (1, 1, 1, or 0, 1, 1) of said bit CMM of the copy management information as shown in said drawing 2 , an adjustable setup of the preset value (or initial value) is carried out. A preset value is switched per sector. In addition, although an adjustable setup is carried out in the above-mentioned bit CMM, an adjustable setup of the above-mentioned preset value shall be carried out by both the bit CMM concerned and said bit CMC to others. An exclusive OR is taken by the above-mentioned ExOR circuit 43, and the output data from a shift register 41 and the input data from a terminal 45 are picked out from a terminal 44 as data by which scramble processing was carried out, and are sent to the copy management information addition circuit of drawing 1 .

[0030] Next, in the replication process 40, two or more optical disk D is manufactured by press working of sheet metal from the master disc MD produced as mentioned above.

[0031] The disk D reproduced by the replication process 40 concerned from the master disc MD has the center hole 102 in the center, as shown in drawing 4 , and the lead-in groove field 103 which turns into the above-mentioned TOC field which is a program management field from the inner circumference of this optical disk D toward a periphery, the program field 104 where program data are recorded, and a program termination field and the so-called lead-out field 105 were formed. In the case of this example, the video data to which processing of compression coding mentioned above to the above-mentioned program field 104 was performed is recorded, and the hour entry of the video data concerned etc. is managed in the above-mentioned lead-in groove field 103. The copy management information mentioned above is recorded in the header of the data sector in the sector of TOC of the above-mentioned lead-in groove field 103, and/or the program field 104.

[0032] Here, as the structure of the data sector in the above-mentioned program field 104 is shown in drawing 5 , it is set to 4 bytes (1 byte is 8 bits below) of data sink section DS, 16 bytes of header unit DH, and 2048 bytes of data-division DD from 4

bytes of EDC (error detection code) section DE, and said copy management information (1 byte) DP is allotted in a header unit DH. Moreover, as the structure of the sector of TOC of the lead-in groove field 103 is shown in drawing 6 , it is set to 4 bytes (1 byte is 8 bits) of data sink section TS, 16 bytes of header unit TH, and 2048 bytes of TOC data-division TD from 4 bytes of EDC (error detection code) section TE, and said copy management information (1 byte) TP is allotted in TOC data-division TD.

[0033] Of course, the above-mentioned copy management information TP can increase a byte count (number of bits) with the copy management information of a file unit (the location of a file, pair of magnitude and copy management information) combining the addresses, such as a file, and can also have copy management information more detailed than said copy management information DP.

[0034] As an original disk, after that, for example, sale, or a rental will be carried out, and optical disk D which was mentioned above will be distributed to a user. Optical disk D of the above-mentioned original will be reproduced by the user by domestic.

[0035] That is, it returns to drawing 1 and a signal (RF signal) is read in optical disk D which rotates with the spindle motor 11 with which rotation servo control is made by the servo circuit 13 with optical head equipment 10 in the regenerative apparatus 50 of optical disk D, such as home use. The RF signal read in optical disk D by the optical head equipment 10 concerned is sent to RF amplifier 12. In RF amplifier 12 concerned, while making the above-mentioned RF signal binary, taking out the signal currently recorded on optical disk D and sending this signal made binary to a demodulator circuit 14, a synchronizing signal is separated from the above-mentioned RF signal, a tracking error signal, a focal error signal, etc. are taken out further, and it sends to the servo circuit 13. In the servo circuit 13, the roll control of a spindle motor 11 and the above-mentioned tracking servo of optical head equipment 10, a focus servo, etc. are performed based on these signals.

[0036] In the above-mentioned demodulator circuit 14, the processing which restores to the modulation performed previously, for example, the processing which changes a 16-channel bit into 8-bit data, is performed. The digital data from the demodulator circuit 14 concerned is sent to the error correction circuit 15, and reverse processing of error-correcting-code-izing performed previously is performed. It is decomposed into a sector by the sector decomposition circuit 16, and the digital video data outputted from this error correction circuit 15 passes along the copy management information reading circuit mentioned later and the Di scramble circuit 31 following it, and is sent to the expanding decryption circuit 21.

[0037] In this expanding decryption circuit 21, expanding decryption processing is performed to the data by which compression coding is carried out according to the regulation of said MPEG 2. The digital data concerned by which the expanding decryption was carried out is changed into an analog video signal by the D/A conversion circuit 23, through the mix circuit 24 mentioned later, after being made by the so-called analog signal of the NTSC system of a television standard broadcasting method with the NTSC encoder 25, is outputted through the NTSC output terminal 28, or is outputted as an analog video signal from an analog output terminal 29.

[0038] Moreover, the digital data from the expanding decryption circuit 21 concerned passes along the digital scramble circuit 31 mentioned later, and is outputted from the digitized output terminal 27 as a digital video data through the digital interface circuitry 26.

[0039] On the other hand, a copy management information reading circuit sends the copy management information which comes to have the reading circuit 18 which reads said added copy management information in the header of a data sector which was mentioned above, and the reading circuit 17 which reads said added copy management information in the TOC data area of the sector of TOC, and was read from the data from the above-mentioned sector decomposition circuit 16 to the copy management information distinction circuit 19. In addition, when copy management information is what is added only to either of the headers of TOC and a data sector, corresponding to it, the above-mentioned reading circuits 17 and 18 also serve as only either.

[0040] The copy management information distinction circuit 19 performs condition distinction of any of the purport which the bit CMM of said drawing 2 of copy management information forbids only prohibition or a digital copy for an analog and a digital copy are directed, and what generation the generation limit of a copy of the bit CMC of said drawing 2 is directing, and outputs the distinction signal according to these distinction result. This distinction signal is sent to the protection signal generation circuit 20 mentioned later. Moreover, the copy management information distinction circuit 19 sends said copy management information to the Di scramble circuit 31.

[0041] The above-mentioned Di scramble circuit 31 has the same configuration as the scramble circuit 9 of said drawing 3 , and an adjustable setup of the preset value (or initial value) based on the copy management information from said copy management information distinction circuit 19 is carried out in this Di scramble circuit 31. Thereby, in the Di scramble circuit 31 concerned, the Di scramble processing, i.e., a code decryption, in which scramble processing in said scramble circuit 9 is solved is

performed. In other words, the Di scramble circuit 31 concerned is read in the TOC data area of the sector of a header or TOC said whose copy management information reading circuit is a data sector, and said scramble cannot be solved without the copy management information supplied through the copy management information distinction circuit 19. The data with which the scramble was solved in this Di scramble circuit 31 will be sent to said expanding decryption circuit 21. In addition, the preset value (or initial value) of the above-mentioned Di scramble circuit 31 shall also be set up based on the key information directed in the above-mentioned copy management information.

[0042] Moreover, in the digital scramble circuit 32 to which the digital data from the above-mentioned expanding decryption circuit 21 was supplied, digital scramble processing is performed to a digital video data from the above-mentioned expanding decryption circuit 21 like said scramble circuit 9 based on copy management information. By this, from the above-mentioned digital scramble circuit 32, the digital video data to which scramble processing was performed will be outputted, and the data concerned will be outputted from the digital interface circuitry 26. In addition, also in this digital scramble circuit 32, it is also possible to perform digital scramble processing based on the key information directed in the above-mentioned copy management information.

[0043] By the way, the digital data which reproduced the signal currently recorded on the optical disk (namely, digital recording medium) [when / which is recorded on another digital recording medium with digital data / so-called / carrying out digital dubbing] Although technique which is recorded on the optical disk by making a predetermined bit ID into copy management information exists as the Prior art mentioned above for the purpose of prevention of an illegal copy described If it skips, the copy management information, i.e., bit ID, concerned, an illegal copy can be realized easily.

[0044] On the other hand, though the above-mentioned copy management information is skipped for the purpose of an illegal copy from the inside of the header of the above-mentioned data sector, or the data area of TOC, since scramble processing based on the copy management information concerned is performed to the digital data currently recorded on optical disk D, it becomes impossible to solve the scramble concerned therefore, and prevention of an illegal copy is possible according to the example of a configuration of above-mentioned this invention. Furthermore, since according to the example of a configuration of this invention said copy management information is needed for the digital data with which the digital scramble processing

concerned was performed being copied in digital dubbing, and solving this scramble in the digital scramble circuit 32 in order to perform digital scramble processing based on said copy management information, illegal anti-copying is realizable also from this.

[0045] In addition, although he is trying to establish the digital scramble circuit 32 in the preceding paragraph of the digital interface circuitry 26 in the above-mentioned example, it is also possible to form a switch 33 instead of the scramble circuit 32 concerned. In this case, if change-over control is carried out so that the switch 33 concerned may be turned off when prohibition of a copy of the contents of the above-mentioned copy management information is shown, the output of a digital video data will be made and it will become possible [preventing the illegal copy in digital dubbing] from the digital interface circuitry 26 also at this time. In addition, when a switch 33 is formed, the signal sent to the switch 33 concerned turns into a switch change-over control signal according to copy management information from said copy management information distinction circuit 19.

[0046] Moreover, it sets to the digital dubbing concerned and is the bit CMC of a generation limit of the above-mentioned copy management information. For example, when having permitted current generation's copy, it is possible also in carrying out as a configuration which does not perform digital scramble processing in the above-mentioned digital scramble circuit 32 (the switch 33 concerned is turned ON when a switch 33 is formed), but outputs digital data as it is. However, at the example of drawing 2 mentioned above, it is Bit CMM. Since it becomes the value which forbids a digital copy anyway, the above-mentioned switch 33 is not turned on in the example of this drawing 2 .

[0047] Here, drawing 7 performs neither the above-mentioned scramble nor the Di scramble, but shows the example in the case of forbidding a copy with a switch 22.

[0048] In the example of this drawing 7 , the data sector-ized while being compressed by the compression coding network 2 are sent to the copy management information addition circuit (addition circuit 5 for adding copy management information in the addition circuit 4 for adding copy management information in TOC, and the header of a data sector) as it is in the mastering process 30. moreover, in a regenerative apparatus 50, the digital video data decomposed into the sector by the sector decomposition circuit 16 passes along a copy management information reading circuit (reading circuits 17 and 18 for reading copy management information in the header of a data sector from a TOC data area, respectively), and sends it to the elongation decryption circuit 21 as it is -- having -- **** -- the digital data from the elongation decryption circuit 21 -- a switch 22 -- a passage -- the digital interface circuitry 26

-- sending -- having -- **** . The distinction signal from the copy management information distinction circuit 19 is sent to a switch 22 as a change-over control signal while it is sent to the protection signal generation circuit 20. Since other configurations and operations are the same as that of the example of drawing 1 mentioned above, they attach the same directions sign as a corresponding part, and omit explanation.

[0049] In the example of this drawing 7 , a switch 22 is made by the change-over control signal according to that distinction result at OFF, when prohibition of a copy of the above-mentioned distinction result is shown. In addition, also when the purport which is the generation by whom the bit CMC of a generation limit of the above-mentioned copy management information is not an original disk, and a copy is forbidden is shown, from the copy management information distinction circuit 19, the change-over control signal which turns OFF the above-mentioned switch 22 is outputted.

[0050] thereby, the output of a digital video data should do from the digital interface circuitry 26 -- it becomes possible to prevent the illegal copy in the so-called digital dubbing which records the digital data which reproduced the signal which there will not be, therefore was recorded on optical disk D (namely, digital disk media) on another digital disk media with digital data.

[0051] Reproduce the digital video data recorded, for example on the original digital recording medium in the example of a configuration of the gestalt of operation of this invention on the other hand, and D/A conversion is once carried out to an analog video signal. This analog signal by which D/A conversion was carried out is transmitted through the analog interface which has analog output and an analog input terminal. A/D conversion of this analog video signal is carried out again after that. Return and carry out digital recording to a digital video data, or [when / which once copies digital-wise or in analog through an analog interface / recording the above-mentioned analog video signal the account of an analog as it is] It enables it to prevent an illegal copy by generating a protection signal as shown in drawing 8 mentioned later in the above-mentioned protection signal generation circuit 20, drawing 10 , and drawing 12 , and mixing this to the video signal of an analog in the mix circuit 24.

[0052] First, the digital video data recorded on the digital recording medium is reproduced using drawing 8 and drawing 9 , D/A conversion is once carried out to an analog video signal, after minding an analog interface, A/D conversion of this analog video signal is carried out again, and it returns to a digital video data, and prevention of

the illegal copy of a case so that digital recording of this may be carried out is explained.

[0053] In addition, the case where the bit CMC of a generation limit of the above-mentioned copy management information is what allows the copy of only one generation from original (that is, the copied data are unreproducible from original after the 2nd generation) is mentioned as an example, and the following explanation explains it.

[0054] That is, in the regenerative apparatus 50 of optical disk D shown in drawing 9 , it distinguishes whether said bit CMM of said copy management information is directing the purport which an analog and digital one, or digital forbid a copy, and what generation the generation limit of a copy of said bit CMC is directing, and the distinction signal according to these distinction result is sent to the protection signal generation circuit 20 in the copy management information distinction circuit 19.

[0055] Here does not show prohibition of an analog copy of the bit CMM of the above-mentioned copy management information, and when it is shown that the bit CMC of the above-mentioned generation limit is an original disk, from the protection code signal generation circuit 74 in the protection signal generation circuit 20, the generation output of the protection code signal PCS which codes and shows that by two or more bits is carried out.

[0056] This protection code signal PCS is sent to the above-mentioned mix circuit 24. In this mix circuit 24, as shown in drawing 8 , the above-mentioned protection code signal PCS is mixed at the predetermined level period of the vertical blanking interval of an analog video signal. In addition, the protection code signal PCS concerned is inserted in theH [283rd] level period for example, in the odd number field in 20H (H shows a level period) eye and the even number field. Moreover, the protection code signal PCS mixed by the above-mentioned analog video signal consists of 14 bits data and 6-bit error detecting code (CRCC), and 8 bits following the 4-bit header in 14 above-mentioned bits data are assigned like said copy management information. The analog video signal with which this protection code signal was added is outputted from an analog output terminal 29.

[0057] The analog output terminal 29 of the above-mentioned regenerative apparatus 50 and the analog input terminal 81 of the optical disk record regenerative apparatus 80 using optical disk RD recordable on the record medium as an example of an image record regenerative apparatus are connected. The analog video signal with which the above-mentioned program code signal outputted from the analog output terminal 29 of the above-mentioned regenerative apparatus 50 was added A/D conversion shall

be carried out with the disk record regenerative apparatus 80, it shall consider as a digital video data, and digital recording of this digital video data shall be carried out to optical disk RD. That is, the record in this case serves as a copy of the 1st generation from an original disk.

[0058] In the optical disk record regenerative apparatus 80 concerned, the analog video signal supplied through the above-mentioned analog input terminal 81 is changed into a digital video data by the A/D-conversion circuit 82. The digital video data concerned is sector-ized per predetermined amount-of-data unit, for example, 2048 bytes, while being sent to the compression coding network 83 and performing compression coding of MPEG 2 specification here. The data which compression coding was carried out and were sector-ized by the compression coding network 83 concerned are sent to the scramble circuit 85.

[0059] The analog video signal with which the above-mentioned protection code signal supplied to the above-mentioned analog input terminal 81 was added on the other hand is sent also to the protection code signal detector 88. In the protection code signal detector 88 concerned, the existence of the protection code signal added to the vertical blanking interval of an analog video signal like said drawing 8 and the condition of the protection code signal concerned are detected, and copy management information is newly generated based on the detected protection code signal concerned.

[0060] Here, the protection code signal supplied to the protection code signal detector 88 concerned at this time is allowed about the copy of the 1st generation from original, as it showed and mentioned above that it was a thing from an original disk.

[0061] Therefore, the protection code signal detector 88 concerned is the bit CMC of a generation limit of copy management information. It changes and outputs to the value which shows that it is the 1st generation from an original disk.

[0062] The copy management information from the above-mentioned protection code signal detector 88 is sent to the scramble circuit 85 and a copy management information addition circuit.

[0063] In the above-mentioned scramble circuit 85, it scrambles to the output data from the above-mentioned compression coding network 83 based on the copy management information from the above-mentioned protection code signal detector 88 like the scramble circuit 9 of above-mentioned drawing 1 . The data by which scramble processing was carried out from the scramble circuit 85 concerned are sent to a copy management information addition circuit. In addition, you may make it use an

encryption circuit instead of this scramble circuit 85.

[0064] A copy management information addition circuit has the addition circuit 86 for adding the above-mentioned copy management information in Above TOC, and the addition circuit 87 for adding copy management information in the header of the above-mentioned data sector like the above-mentioned. The data with which copy management information was added by this copy management information addition circuit like the above-mentioned and by which scramble processing was carried out [above-mentioned] are sent to an encoder / modulation circuit 89.

[0065] to the supplied data, an encoder / the modulation circuit 89 concerned perform data delay and a parity account as error correcting code-ized processing, add parity, according to a predetermined modulation technique, change 8 bit data into the modulation data of a 16 - channel bit, add the synchronizing signal of the so-called pattern of the AUTOOBU rule which break the modulation regulation of a modulation technique further predetermined [above-mentioned] per predetermined amount of data, and send the data after these processings to optical head equipment 90.

[0066] The optical head equipment 90 concerned performs optical record by irradiating the laser beam driven based on the data supplied from the encoder / modulation circuit 89 to recordable optical disk RD which rotates with the spindle motor 91 by which rotation servo control is applied. in addition, the record to this optical disk RD -- the so-called light -- the case where it considers as magnetic record -- possible -- the light concerned -- the magnetic head prepares on both sides of optical disk RD in the above-mentioned optical head equipment 90 and the location which counter, and while irradiating the laser beam of sufficient power to raise the magnetic film formed on optical disk RD more than Curie temperature from optical head equipment 90, it makes drive the magnetic head based on the signal from above-mentioned encoder / modulation circuit 89, in performing magnetic record It means that the digital video data which once generated the digital video data from an original disk again through the analog interface was copied to optical disk RD by this.

[0067] Next, optical disk RD to which the digital video data was copied from the original disk as it mentioned above is reproduced. Carry out D/A conversion to an analog video signal once, carry out A/D conversion of this analog video signal again, and it returns to a digital video data. Even if the copy concerned of the 2nd generation is made, it is preventing from reproducing data from the optical disk RD concerned by things making it be the following, when [which records this on optical disk RD in which still more nearly another record is possible] it is made like (that is, the copy of the 2nd generation is performed). That is, it reproduces by, for example, loading the

regenerative apparatus 50 of drawing 9 with the disk RD with which the copy of the 1st generation was made again, and when [like / (that is the copy of the 2nd generation is performed)] copying again the analog video signal acquired by this playback with the optical disk record regenerative apparatus 80 of drawing 9 , it is made as follows.

[0068] That is, in a regenerative apparatus 50, the data read from optical disk RD by which the copy of the 1st above-mentioned generation was made are sent to the reading circuits 17 and 18 of copy management information like the above-mentioned, and the copy management information taken out by these reading circuits 17 and 18 is sent to the copy management information distinction circuit 19.

[0069] The judgment signal from the copy management information distinction circuit 19 concerned is sent to the protection signal generation circuit 20, and the protection code signal PCS is outputted from this protection signal generation circuit 20, and it is sent to the mix circuit 24. The analog video signal by which was processed like the above-mentioned in the expanding decryption circuit 21 after the Di scramble processing was carried out in the Di scramble circuit 31, and D/A transform processing was further carried out by the D/A conversion circuit 23 is supplied to the mix circuit 24 concerned. The analog video signal with which the above-mentioned protection code signal PCS was mixed with by the above-mentioned analog video signal in the mix circuit 24 concerned, and the protection code signal PCS concerned was mixed is outputted through an analog output terminal 29.

[0070] The analog output terminal 29 of the above-mentioned regenerative apparatus 50 is connected with the analog input terminal 81 of the optical disk record regenerative apparatus 80, and the analog video signal with which the above-mentioned program code signal outputted from the analog output terminal 29 of the above-mentioned regenerative apparatus 50 was added is inputted through the analog input terminal 81 of the disk record regenerative apparatus 80 concerned.

[0071] In the optical disk record regenerative apparatus 80 concerned, the analog video signal supplied through the above-mentioned analog input terminal 81 is changed into a digital video data by the A/D-conversion circuit 82 like the above-mentioned, compression coding and sector-ization are further performed by the compression coding network 83, and this data is sent to the scramble circuit 85.

[0072] The analog video signal with which the above-mentioned protection code signal supplied to the above-mentioned analog input terminal 81 was added on the other hand is sent also to the protection code signal detector 88.

[0073] Here, it is shown that the protection code signal supplied to the protection

code signal detector 88 concerned at this time is a thing from the optical disk with which the copy of the 1st generation was made. The above-mentioned protection code signal detector 88 at this time is changed and outputted to the value which shows that it is the 2nd generation from an original disk about the bit CMC of a generation limit of copy management information.

[0074] The copy management information from the above-mentioned protection code signal detector 88 is sent to the scramble circuit 85 and a copy management information addition circuit. Like the above-mentioned, in the scramble circuit 85, based on the copy management information from the above-mentioned protection code signal detector 88, it scrambles to the output data from the compression coding network 83, and the above-mentioned copy management information is added and outputted to the data by which scramble processing was carried out from the scramble circuit 85 concerned in the above-mentioned copy management information addition circuit.

[0075] In addition, in using an encryption circuit instead of the above-mentioned scramble circuit 85, it outputs the above-mentioned protection code signal detector 88 as a control signal to which control which enciphers in the encryption circuit concerned is made to carry out. At this time, it can also consider as the key information on encryption of this control signal. By this, the enciphered digital video data will be outputted from the encryption circuit concerned.

[0076] the data outputted from the above-mentioned copy management information addition circuit are sent to optical head equipment 90 or the magnetic head, after error correcting code-ized processing, modulation data processing, etc. are performed in an encoder / modulation circuit 89 -- having -- optical disk RD -- receiving -- the above-mentioned -- the same -- optical or light -- magnetic record is performed.

[0077] Next, optical disk RD by which the above copies of the 2nd generation were made is read by the optical head equipment 90 of the optical disk record regenerative apparatus 80 concerned, and this read data is sent to the reversion system of the optical disk record regenerative apparatus 80 concerned.

[0078] The digital regenerative circuit 92 of a reversion system has the above-mentioned copy management information reading circuit, the copy management information distinction circuit 19, and Di scramble circuit 31 grade with the main components of the same RF circuit 12 as said regenerative apparatus 50, a demodulator circuit 14, the error correction circuit 15, the sector decomposition circuit 16, and expanding decryption circuit 21 grade.

[0079] In the copy management information distinction circuit of the digital

regenerative circuit 92 concerned, the optical disk RD concerned knows that the copy of the 2nd generation will be made by distinguishing the bit CMC of a generation limit of the copy management information read from the optical disk RD concerned. At this time, the copy management information distinction circuit 19 of the digital regenerative circuit 92 concerned outputs and twists copy management information as opposed to the Di scramble circuit 31 (or the copy management information which cannot carry out the Di scramble is outputted), and makes it like.

[0080] Even if the data sent to the expanding decryption circuit 21 in the digital regenerative circuit 92 concerned turn into data with which the Di scramble processing is not made by this, therefore it carries out expanding decryption processing of the data concerned in the expanding decryption circuit 21 concerned, a normal digital video data will be obtained. For this reason, a normal image will be acquired, even if it changes into an analog signal the data outputted from the digital regenerative circuit 92 concerned by the D/A conversion circuit 93 and sends to a television receiver 71 through an analog output terminal 94.

[0081] Since it seems that it mentioned above, when according to the above-mentioned configuration reproduce the digital video data recorded on the original digital recording medium, D/A conversion is once carried out to an analog video signal, it carries out A/D conversion of this analog video signal again and it returns and carries out digital recording to a digital video data, a generation limit is enabled, and it becomes possible to prevent an illegal copy. That is, in an above-mentioned example, since a normal image is not acquired even if it reproduces this and projects on a television receiver 71, since it is that by which the scramble is not solved, it means that this recorded data had prevented the illegal copy as a result although it is possible for the 2nd generation to record data on optical disk RD.

[0082] Moreover, in the digital copy through this analog interface, it also sets. As well as the above-mentioned though it skipped copy management information for the purpose of the illegal copy in the case of playback of optical disk RD in a regenerative apparatus 50 Since scramble processing based on the copy management information concerned is performed to the digital data currently recorded on optical disk RD Since it becomes impossible to solve a scramble in the Di scramble circuit 31 and it becomes impossible to generate the protection code signal based on copy management information also in the protection code signal generation circuit 74, prevention of an illegal copy is attained. That is, in the optical disk record regenerative-apparatus 80 side, since the generation of copy management information based on a protection code signal becomes impossible, it becomes

possible for it to become impossible to solve a scramble in the scramble circuit 85 therefore, and to prevent an illegal copy. Moreover, when it aims at an illegal copy, it is also considered that do not skip copy management information, for example, a mask etc. carries out a protection code signal, but since it becomes impossible to solve a scramble also in this case in the scramble circuit 85 of the optical disk record regenerative apparatus 80, an illegal copy can be prevented.

[0083] In addition, in an above-mentioned example, the copy of the 1st generation from [from an original disk] the value which the copy of the 1st generation also forbids the bit CMC of a generation limit of said copy management information although the example allowed about the copy of the 1st generation is given, then an original disk can also be prevented.

[0084] Furthermore, although the above-mentioned example explains the example which uses optical disk RD recordable as a record regenerative apparatus 80, it cannot be overemphasized that the same anti-copying can do a digital video data to a video tape TP even if it is equipment in which an account rec/play student is possible.

[0085] Next, although the above-mentioned example explained the case so that the digital video data recorded on the original digital recording medium is reproduced, D/A conversion is once carried out to an analog video signal, A/D conversion of this analog video signal may be carried out to a digital video signal and it may carry out digital recording to it again, an illegal copy can be prevented also when recording an analog video signal the account of an analog as it is.

[0086] The digital video data recorded on the original digital recording medium is reproduced hereafter, using drawing 10 and drawing 11 , D/A conversion is once carried out to an analog video signal, and prevention of the illegal copy of a case so that this analog video signal may be recorded the account of an analog with the conventional analog video tape recorder (analog VTR) is explained.

[0087] namely, in the regenerative apparatus 50 of optical disk D shown in drawing 11 in this case When prohibition of an analog copy of the bit CMM of copy management information is shown and the distinction signal from the above-mentioned distinction circuit 19 supports prohibition of the analog copy concerned, The analog protection pulse APP which is a white peak signal is generated in the protection pulse forming network 72 in the protection signal generation circuit 20. He is trying to mix the analog protection pulse APP concerned in the above-mentioned mix circuit 24 at the predetermined period of the vertical blanking interval of an analog video signal, as shown in drawing 11 . Furthermore, with these, also when copy management information is not supplied, the analog protection pulse APP shall be generated in the

protection pulse forming network 72. In addition, bit CMC of the generation limit shown by the above-mentioned copy management information Also while directing the purport which forbids a now current generation's analog copy, from the copy management information distinction circuit 19, the distinction signal corresponding to prohibition of an analog copy is outputted. The system which forbids such an analog copy is called APS (Analog Protection System).

[0088] As for the output signal from the above-mentioned mix circuit 24, two or more pairs of the false synchronization pulse of predetermined sequence and a forward pulse were added to the above-mentioned video signal within the vertical blanking interval of an analog video signal following the synchronization pulse. For example, by the example of drawing 10 , two or more pairs of pulse pairs of the false synchronization pulse P12 and the forward pulse (for example, white peak pulse) P14 are inserted between two equalizing pulses P10 in one line (1 level period). In addition, what uses the combination signal of such two or more false synchronization pulses and two or more white peak signals as an image transcription scramble signal is indicated in JP,61-288582,A. This false synchronization pulse (PSP:Pseudo-Sync Pulse) Used APS is also called PSP system.

[0089] Such an image transcription scramble signal explains briefly the reason a normal image transcription becomes impossible with a common video tape recorder (VTR).

[0090] The analog output terminal 29 of the above-mentioned regenerative apparatus 50 and the analog input terminal 61 of an analog VTR 60 are connected, and suppose that the analog video signal which added the above-mentioned image transcription scramble signal outputted from the analog output terminal 29 of the above-mentioned regenerative apparatus 50 is recorded on a video tape TP by the analog VTR 60.

[0091] Generally, the above-mentioned analog VTR 60 has the AGC (Automatic Gain Control) circuit 62 which is an automatic amplitude adjustment device or an automatic-gain-control means, and is made as [perform / to the analog video signal inputted through the analog input terminal 61 / this AGC circuit 62 / automatic amplitude adjustment]. If an analog video signal as shown in above-mentioned drawing 10 is supplied to the analog VTR 60 equipped with such AGC circuit 62, above-mentioned AGC circuit 62 will react to the white peak signal added to the above-mentioned vertical blanking interval, and will come to narrow the amplitude of an original video signal. That is, AGC circuit 62 of a common video tape recorder cannot identify the above-mentioned equalizing pulse P10 and the false synchronization pulse P12, but for this reason, AGC circuit 62 carries out the sample

of the level of the added forward pulse P14, and it performs control whose input signal level is usual and which recognizes accidentally [be / several times] and reduces gain. Therefore, the analog video signal with which automatic amplitude adjustment was made by this AGC circuit 62 is recorded on a video tape TP through the analog record circuit 65, and if this video tape TP is played after that in the analog regenerative circuit 67 and it projects with a television receiver 70 through an analog output terminal 68, it will become a very unsightly image, such as causing abnormalities to the light and darkness of a playback image.

[0092] The digital video data recorded on the original digital recording medium by this is reproduced, D/A conversion is once carried out to an analog video signal, and prevention of the illegal copy of a case so that this analog video signal may be recorded the account of an analog by the conventional analog VTR becomes possible including a generation limit.

[0093] Moreover, in the analog copy through this analog interface, it also sets. Though copy management information was skipped for the purpose of the illegal copy like the above-mentioned in the case of playback of optical disk RD in a regenerative apparatus 50 Since scramble processing based on the copy management information concerned is performed to the digital data currently recorded on optical disk RD Since he is trying to generate a protection pulse also when it becomes impossible to solve a scramble in the Di scramble circuit 31 and copy management information is not supplied in the protection code signal generation circuit 74, prevention of an illegal copy is attained.

[0094] In addition, although the reaction of AGC circuit 62 by the analog protection pulse APP is used in the example of the analog VTR 60 of drawing 11 For example, while forming the detector 63 which detects the analog protection pulse APP from the analog video signal supplied through the above-mentioned analog input terminal 61 to the analog VTR 60 concerned AGC circuit 62 for example, when a switch 64 is formed in the latter part and the analog protection pulse APP is detected in the above-mentioned analog protection pulse detector 63 It also becomes possible [forbidding an illegal copy] to consider as a configuration which turns OFF the above-mentioned switch 64. That is, if the above-mentioned switch 64 is turned off, since it will become impossible to record the analog video signal supplied to the analog input terminal 61 on a video tape TP, it becomes possible to prevent an illegal copy.

[0095] Moreover, although the above-mentioned example of a configuration explained using the analog VTR which uses a video tape TP, even if it is an analog videodisk record regenerative apparatus using the analog videodisk AD, it cannot be

overemphasized that the anti-copying technique of this invention mentioned above can be used.

[0096] Furthermore, as this invention shows to drawing 12 and drawing 13 , A/D conversion of the analog video signal which was mentioned above can be carried out again, it can transmit through an analog interface, and an illegal copy can be forbidden also [in both a case so that digital recording of this may be returned and carried out to a digital video data after that, and a case so that the above-mentioned analog video signal may be transmitted through an analog interface and it may record the account of an analog as it is].

[0097] That is, it sets to the regenerative apparatus 50 of optical disk D shown in drawing 13 , and a copy management-information distinction circuit 19 is said bit CMM of said copy management information. The distinction circuit 71 which performs condition distinction, and the bit CMC of said copy management information It consists of a distinction circuit 73 performed in condition distinction, the distinction signal from these distinction circuits 71 and 73 is sent to the protection signal generation circuit 20, and copy management information is sent to the Di scramble circuit 31 and the digital scramble circuit 32.

[0098] In the above-mentioned Di scramble circuit 31 and the digital scramble circuit 32, the same processing as the above-mentioned is performed.

[0099] Moreover, the protection signal generation circuit 20 consists of a protection pulse forming network 72 which generates said analog protection pulse APP based on the distinction signal from the above-mentioned distinction circuit 71, and a protection code signal generation circuit 74 which generates said protection code signal PCS based on the distinction signal from the above-mentioned distinction circuit 73. Said analog protection pulse APP from these protection pulse forming network 72 and said protection code signal PCS from the protection code signal generation circuit 74 are sent to said mix circuit 24.

[0100] By this, from the mix circuit 24 concerned, as shown in drawing 12 , while the above-mentioned protection code signal PCS is mixed at the predetermined period of the blanking period of an analog video signal, the signal with which two or more white peak signals were together put on two or more false synchronization pulses (false equivalence pulse) will be outputted.

[0101] The above-mentioned protection code signal APP and the analog video signal with which the analog protection pulse APC was added are outputted from an analog output terminal 29.

[0102] It will connect with the analog input terminal 81 of the optical disk record

regenerative apparatus 80 using recordable optical disk RD, and the analog input terminal 61 of an analog VTR 60, and by the above-mentioned analog VTR 60, the above-mentioned analog video signal is recorded the account of an analog on a video tape TP, and with the above-mentioned optical disk record regenerative apparatus 80, the analog output terminal 29 of the above-mentioned regenerative apparatus 50 will record it on optical disk RD, after changing the above-mentioned analog video signal into a digital video data. Since record playback actuation with the above-mentioned analog VTR 60 and the optical disk record regenerative apparatus 80 is the same as that of the above-mentioned, those explanation is omitted here. However, in the optical disk record regenerative apparatus 80, when detection of the analog protection pulse APP is also performed besides detection of said protection code signal PCS in the protection code signal detector 88 and the analog protection pulse APP concerned is detected, an illegal copy is prevented by making it make scramble processing in the scramble circuit 85 perform.

[0103] Next, the gestalt of the operation of further others of this invention is explained. Otherwise, the example of the copy management information shown in above-mentioned drawing 2 , the example of the scramble circuit shown in drawing 3 , the example of sector format shown in drawing 5 or drawing 6 can consider various examples.

[0104] Drawing 14 shows other examples of copy management information. For example, the inside of 8 bits of b7-b0, for example, copy generation-control system CGMS (Copy Generation Management System) by which the bit of b7 and b6 by the side of a high order restricts the generation of a copy Information bit CMC It is assigned. ****** -- the following bit of b5 and b4 -- for example, trigger bit CMT of APS (Analog Protection System) mentioned above ****** -- bit CMA with which it is assigned and the following bit b3 indicates it to be whether it is the analog source ****** -- it is assigned. b2 remaining-b0 remaining are an undefined. here -- the bit (b7, b6) of Above CMC -- for example, (0 0), the time -- a copy free-lancer -- (-- the ban on a copy is shown, respectively at an one-generation copy good and the time of (1, 1) at the time of 1 and 0), and (0, 1) are intact. The above-mentioned APS trigger bit CMT A bit (b5, b4) PSP which showed OFF when for example, (0 0), and (0, 1) solved, and was mentioned above (false synchronization pulse-seudo-Sync Pulse) It turns on. Turning off the split burst (or color stripe) mentioned later is shown. Turning on PSP at the time of (1, 0), and turning on a split burst of two lines is shown, and turning on PSP at the time of (1, 1), and turning on a split burst of four lines is shown. Moreover, the above CMA The bit b3 shows except [its] for analog package media,

respectively at the time of 0 at the time of 1.

[0105] The above-mentioned APS trigger bit CMT It means inserting the analog protection pulse APP as the contents indicated to be the above-mentioned PSP ON to above-mentioned drawing 10 or drawing 12 between the predetermined periods within a vertical blanking interval, 12H-19H [for example,]. ON of the above-mentioned split burst meaning reversing partially the color burst prepared in the location after the horizontal synchronizing pulse within a horizontal blanking interval, and performing color burst reversal of two lines continuously every 17 lines with a two-line split bar stone -- moreover, a four-line split bar stone means performing color burst reversal of four lines continuously every 21 lines, respectively. In addition, color burst reversal is actuation in which a part of color burst signal for the first portion etc. is reversed, or a phase is changed, and produces color active jamming like color stripe generating to the copied color video signal by such reversal split color burst.

[0106] Here, in Rhine where color burst reversal which drawing 15 is drawing for explaining the above-mentioned reversal split color burst APS, and was mentioned above is given, the phase of a part of color burst CB used as the reference signal of the chrominance subcarrier (color subcarrier) allotted to the location after horizontal synchronizing pulse HD, for example, the slash section in drawing, is reversed. namely, the color burst section CN in standard NTSC system for example, 9 cycles -- it is -- this color burst standard section CN a front location -- the Puri section CP ****** -- for example, the burst signal for a two cycle connects -- having -- all -- it is the color burst of 11 cycles. This Puri section CP A two cycle and the color burst standard section CN The front section CF of the inner first portion The burst phase of 5.5 cycles with 3.5 cycles is reversed, and it is the remaining color burst standard section CN. The back section CB of the inner second half section 5.5 cycles are left intact.

[0107] What is necessary is to generate such a color burst signal by which phase inversion was carried out the part in the protection pulse forming network 72 of above-mentioned drawing 11 or drawing 13 , to follow the mix circuit 24 every 17 lines at the time of two lines of delivery and the above-mentioned two-line split bar stone, to mix a phase inversion color burst, and just to mix the phase inversion color burst of four lines continuously every 21 lines at the time of the above-mentioned four-line split bar stone.

[0108] in addition, as actuation of the above-mentioned split burst, it limits to 180-degree change which reverses a part of phases of a color burst -- not having --

a phase -- 90 degrees and 270 degrees -- or you may make it change only the include angle of arbitration Moreover, the section to change is not limited to 5.5 cycles, but can be set as arbitration.

[0109] Next, drawing 16 shows other examples of the scramble circuit used as instead of [of the example of the scramble circuit shown in above-mentioned drawing 3]. At the example of this drawing 16 , the exclusive-OR (ExOR) circuit 42 is used for the 15-bit shift register 41 for a scramble, and it is generating-polynomial x15+x4+1. It differs from the example of above-mentioned drawing 3 in that the feedback which followed is applied, and since other configurations are the same, they attach the same directions sign as a corresponding part, and omit explanation.

[0110] Next, sector format as shown in drawing 17 can be used instead of the example of sector format shown in above-mentioned drawing 5 or drawing 6 .

[0111] In the example of this drawing 17 , 1 sector consists of 12 lines of 172 bytes of one line, i.e., 2064 bytes, and contains 2048 bytes of Maine data in this. 4 bytes of ID (discernment data), 2 bytes of IED (ID error detection sign), and 6 bytes of RSV (reserve) are arranged in the head location of the line of the beginning of 12 lines at this order, and 4 bytes of EDC (error detection sign) is arranged in the termination location of the last line.

[0112] As 4 bytes of Above ID (discernment data) are shown in drawing 18 , the cutting tool (bits b31-b24) of the beginning by the side of MSB consists of sector information, and the remaining 3 bytes (bits b23-b0) consist of the sector number. Sector information consists of each information with a 1-bit sector-format type, the tracking approach of 1 bit, a reflection factor [of 1 bit], a reserve of 1 bit, an area type of 2 bits, and a layer number of 2 bits sequentially from the MSB side.

[0113] What is necessary is just to let a number of bytes for the Maine data division, or dozens of bytes collectively be a field for copy management information by the sector format in a TOC field about the above-mentioned copy management information at the sector format in a data area using 1 byte of the above-mentioned 6 bytes of RSV that what is necessary is just to make it prepare in the predetermined location of such a sector format.

[0114] In addition, although the record playback to an optical disk or a video tape is mentioned as an example and the example of a configuration mentioned above explains it, this invention is applicable also in the case of transmission of digital data. For example, an illegal copy can be prevented, if the above-mentioned transmission control information is transmitted along with this enciphered digital data while enciphering to the digital data which transmits a part of above-mentioned copy

management information and same transmission control information as key information (scramble). As signal-transmission equipment corresponding to the signal-transmission approach of this this invention, it changes into a means to perform encoding according to a transmission system of an encoder/modulation circuit, and modulation processing in the configuration of said drawing 1 , drawing 9 , drawing 11 , and drawing 13 , and further, if the optical head equipment for record playback, an interface means with the exterior, etc. are change into a data transmitting means or a receiving means, it is applicable as it is.

[0115] Moreover, although the example mentioned above described only the scramble / Di scramble in encryption processing, of course, transform processing other than this is also possible. Furthermore, although transform processing by the side of record of drawing 1 is made in the scramble circuit 9, it may be performed in the compression coding network 2, or the encoder/modulation circuit 6. In this case, transform processing by the side of playback will be similarly performed instead of the Di scramble circuit 31 by any of a demodulator circuit 14, the error correction circuit 15, the sector decomposition circuit 16, and the expanding decryption circuit 21 they are. To carry out by any of the above-mentioned demodulator circuit 14, the error correction circuit 15, the sector decomposition circuit 16, and the expanding decryption circuit 21 they are, the information for distinguishing in the copy management information distinction circuit 19 needs to come to hand before it. In addition, since TOC information comes to hand in this case at the very beginning, the thing from the TOC information concerned can be used.

[0116] As mentioned above, according to the example of a configuration of the gestalt of operation of this invention, it becomes possible to take the measures against an illegal copy at coincidence at both analog copy and digital copy.

[0117] As explained above, according to the signal regeneration approach and equipment in a gestalt of operation of this invention, an illegal copy can be prevented by performing predetermined transform processing to the analog signal which come to carry out D/A conversion of digital data and/or this digital data based on the predetermined location on the signal record medium with which the digital data be recorded, for example, the playback mode control signal field section, and the record control information allotted to each header unit of sector-izing.

[0118] Moreover, according to the signal record approach and equipment in a gestalt of operation of this invention A signal is enciphered by making a part of record control information [at least] for managing record of a signal record medium into key information. Or a signal is enciphered using the key information directed by a part of

record control information [at least]. An illegal copy can be prevented by allotting this record control information to the predetermined location of each record unit of the signal to the playback mode control signal field section of a signal record medium, and/or a signal record medium, and recording on a signal record medium with the enciphered signal.

[0119] Furthermore, according to the signal-transmission approach and equipment in a gestalt of operation of this invention, an illegal copy can be prevented by performing predetermined transform processing to the analog signal which comes to carry out D/A conversion of digital data and/or this digital data based on the transmission control information for managing transmission which accompanies the transmitted digital data.

[0120] Furthermore, the signal-transmission approach and equipment in a gestalt of operation of this invention can prevent an illegal copy by enciphering a signal using the key information to which a signal is directed by a part of encryption or record control information [at least] by making a part of transmission management information [at least] for managing transmission of a signal into key information, and transmitting transmission control information along with this enciphered signal.

[0121] Furthermore, while allotting and recording the record control information for managing record of the signal to a signal record medium on the predetermined location of the playback mode control signal field section and/or each record unit of a signal according to the signal record medium in the gestalt of operation of this invention, an illegal copy can be prevented by enciphering and coming to record a signal by making a part of record control information [at least] into key information.

[0122] That is, according to the gestalt of operation of this invention, prevention of the illegal copy to both digital copy and analog copy is aimed at by being made to perform predetermined transform processing based on record control information or transmission control information, for example to both digital data and analog signal, and performing scramble processing for encryption to digital data to an analog signal as the predetermined transform processing concerned. Moreover, since the signal is enciphered based on record control information or transmission control information, if record control information or transmission control information is skipped and it reproduces, encryption cannot be solved, therefore prevention of an illegal copy is possible according to the gestalt of operation of this invention.

[0123] According to the video-signal regenerative apparatus and approach in a gestalt of operation of this invention, moreover, with a digital video signal The playback mode control signal field section prepared in the start edge of a spiral-like recording track,

And/or, the image transcription control code for the illegal copy prevention allotted to each header unit of the sector-ized digital video signal reproduces a digital signal from the digital disk media which it comes to record. Finally obtain an analog video-signal output at least, and the condition of the above-mentioned image transcription control code is detected. Based on this detection output, the image transcription scramble signal and/or image transcription inhibiting signal of a mode of an analog video signal are generated. An illegal copy can be prevented by adding the above-mentioned image transcription scramble signal and/or an image transcription inhibiting signal to the predetermined field of the vertical-retrace-line period of the analog image output signal which changed and acquired the digital video signal, and outputting this analog video signal.

[0124] Moreover, according to the combination equipment and the approach of image reproduction and record in the gestalt of operation of this invention The digital disk media with which it comes to record the above-mentioned digital video signal and an image transcription control code are reproduced. It is the combination equipment and the approach of the video-signal playback which outputs and records an analog video signal at least, and record. Based on the condition detection output of an image transcription control code, the image transcription scramble signal of the mode of an analog signal is generated. The above-mentioned image transcription scramble signal is added and outputted to the predetermined field of the vertical-retrace-line period of the analog video signal which changed and acquired the digital video signal. Moreover, an illegal copy can be prevented by having recorded the input analog video signal by which amplitude adjustment was carried out with the automatic amplitude adjustment device reacted to the image transcription scramble signal included in an input analog video signal on the analog image transcription medium.

[0125] Furthermore, according to the combination equipment and the approach of video-signal playback and record in the gestalt of operation of this invention Based on the condition detection output of an image transcription control code, the image transcription inhibiting signal of the mode of an analog video signal is generated. An image transcription inhibiting signal is added and outputted to the predetermined field of the vertical-retrace-line period of the analog video signal which changed and acquired the digital video signal. Moreover, an illegal copy can be prevented by operating an image transcription prohibition means according to the image transcription inhibiting signal included in an input analog signal in an input analog signal an analog or when recording in digital one.

[0126] Furthermore, the digital disk media in the gestalt of operation of this invention

are for making the video-signal playback approach of the gestalt operation of above-mentioned this invention correspond, and can prevent an illegal copy by coming to record the image transcription control code which is the signal which functions in order to make an image transcription scramble signal and/or an image transcription inhibiting signal generate with the digitized video signal.

[0127] namely, the analog video signal which according to the gestalt of operation of this invention carried out D/A conversion of the digital video signal read from digital disk media, and acquired it -- outputting -- facing -- this analog video signal -- the voice of an analog video signal -- the analog video signal with which the image transcription scramble signal [like] and/or the image transcription inhibiting signal were added, and this image transcription scramble signal and/or an image transcription inhibiting signal were added -- an analog -- or he is trying to make it record on a record medium in digital one By this, the video signal reproduced from the analog or digital disk media after record will become that to which the scramble was applied, or the image transcription itself will be made.

[0128] In addition, although the explanation mentioned above explains the optical disk and the video tape as a signal record medium In addition, semi-conductor storages, such as so-called IC card, so-called various memory devices, etc., It is also possible to use magnetic-disk media, such as a hard disk and a flexible disk. Besides the disk with which record by the pit is made also in an optical disk, and a magneto-optic disk Various kinds of disks, such as a phase-change optical disk, an organic-coloring-matter mold optical disk, an optical disk with which record is made by the ultraviolet-rays laser beam, and an optical disk which has multilayer record film, can be used, and a tape-like record medium can also be applied not only to a video tape but to other things of various kinds of.

[0129]

[Effect of the Invention] In this invention, the analog video signal with which the protection signal for illegal copy prevention was added within the vertical blanking interval is inputted. The analog video signal from the above-mentioned signal input terminal is changed into a digital video data. The copy management information which becomes the digital video data by which conversion was carried out [above-mentioned] from the bit which manages a generation limit of the copy for illegal copy prevention It adds to the predetermined location of each record unit in the lead-in groove field section of an optical disk, and/or a program field. Modulate the output by which addition was carried out [above-mentioned] to digital modulation data, and the digital modulation output by which the modulation was carried out

[above-mentioned] is recorded on an optical disk record medium. By detecting the protection signal within the vertical blanking interval of the above-mentioned analog video signal, and adding the above-mentioned copy management information to the above-mentioned digital video data based on this detection output It is possible to forbid to change an analog video signal into a digital video data, and to carry out an illegal copy to an optical disk record medium, and to also forbid a gradual generation copy.

[0130] Moreover, in this invention, the analog video signal with which the protection signal for illegal copy prevention was added within the vertical blanking interval is inputted. The analog video signal from the above-mentioned signal input terminal is changed into a digital video data. The copy management information for illegal copy prevention is added to the digital video data by which conversion was carried out [above-mentioned]. Modulate the output by which addition was carried out [above-mentioned] to digital modulation data, and the digital modulation output by which the modulation was carried out [above-mentioned] is recorded on a semi-conductor storage. The protection code signal included in 20H within the vertical blanking interval of the above-mentioned analog video signal (H is a level period), Or/and, by detecting the protection signal included in 12H - 19H (H is a level period), and adding the above-mentioned copy management information to the above-mentioned digital video data based on this detection output It is possible to forbid to change an analog video signal into a digital video data, and to carry out an illegal copy to a semi-conductor storage.

[0131] Furthermore, in this invention, the analog video signal with which the protection signal for illegal copy prevention was added within the vertical blanking interval is inputted. The analog video signal from the above-mentioned signal input terminal is changed into a digital video data. Scramble the digital video data by which conversion was carried out [above-mentioned], and the output by which the scramble was carried out [above-mentioned] is modulated to digital modulation data. Memorize the digital modulation output by which the modulation was carried out [above-mentioned] to a semi-conductor storage, and the protection signal within the vertical blanking interval of the above-mentioned analog video signal is detected. It is possible by scrambling the above-mentioned digital video data based on this detection output to forbid to change an analog video signal into a digital video data, and to carry out an illegal copy to a semi-conductor storage.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is drawing for explaining a master disc making process and the reproduced playback process of a disk.

[Drawing 2] It is drawing for explaining copy management information.

[Drawing 3] It is the circuit diagram showing the concrete configuration of a scramble circuit.

[Drawing 4] It is drawing for explaining the structure of an optical disk.

[Drawing 5] It is drawing for explaining the configuration of a data sector.

[Drawing 6] It is drawing for explaining the configuration of the sector of TOC.

[Drawing 7] It is drawing for explaining other examples of a master disc making process and the playback process of the reproduced disk.

[Drawing 8] It is the wave form chart showing the condition that the protection code signal was added to the analog video signal.

[Drawing 9] It is the block circuit diagram showing the configuration for realizing illegal copy prevention at the time of changing a digital video data into an analog video signal, changing this into a digital video data further, and copying.

[Drawing 10] It is the wave form chart showing the condition that the analog protection pulse was added to the analog video signal.

[Drawing 11] It is the block circuit diagram showing the configuration for realizing illegal copy prevention at the time of changing a digital video data into an analog video signal, and copying this in analog.

[Drawing 12] It is the wave form chart showing the condition that the analog

protection pulse and the protection code signal were added to the analog video signal.
[Drawing 13] It is the block circuit diagram showing the configuration for changing a digital video data into an analog video signal, and realizing an analog and illegal copy prevention at the time of copying in digital one for this.
[Drawing 14] It is drawing for explaining other examples of copy management information.
[Drawing 15] It is drawing for explaining the reversal process of a color burst.
[Drawing 16] It is the circuit diagram showing other concrete configurations of a scramble circuit.
[Drawing 17] It is drawing for explaining other examples of sector format.
[Drawing 18] It is drawing for explaining the example of a configuration of the sector header of the sector format of drawing 17 .
[Description of Notations]
9 Scramble Circuit 17 Copy Management Information Reading Circuit in TOC, 18 Copy management information reading circuit in the header of a data sector 19 Copy management information distinction circuit, 20 Protection signal generation circuit 24 Mix circuit, 31 The Di scramble circuit 32 Digital scramble circuit, 62 AGC circuit 72 Protection pulse forming network 74 Protection code signal generation circuit, 81 Input terminal 82 A/D-conversion circuit 85 Scramble circuit, Addition circuit of the copy management information into 86TOC 87 Addition circuit of the copy management information into the header of a data sector 88 Protection code signal detector 89 Encoder/modulation circuit 90 Optical head equipment RD optical disk